EXHIBIT 11

1019

RECORD HILL WIND LLC
RECORD HILL WIND PROJECT
OXFORD COUNTY
ROXBURY, MAINE

SOUND LEVEL ASSESSMENT

Prepared by:

Resource Systems Engineering
30 Parkers Way, P.O. Box K
Brunswick, Maine 04011-0835
207 725-7896 / Fax 207 729-6245
E-Mail rse@gwi.net

File 070830/2.5.5.2

December 1, 2008
Revised: January 20, 2009
(Remove Pre-Development Ambient Sound Level Information per MDEP)

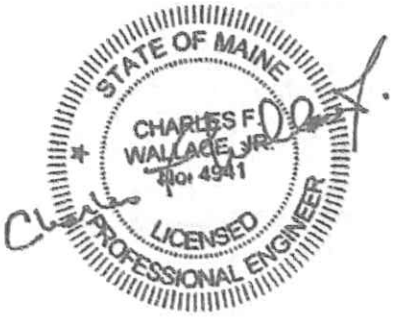
Resource
Systems
Engineering

1020

ACKNOWLEDGMENTS

Resource Systems Engineering (RSE) wishes to acknowledge Record Hill Wind LLC, Wagner Forest Management Ltd and Stantec Consulting for their contributions to this Sound Level Assessment.

RSE personnel responsible for this investigation and report are Charles F. Wallace, Jr., P.E., R. Scott Bodwell, P.E., Tina J. Jones and C. Phillip Botts.



COPYRIGHT

DISCLAIMER

This document has been prepared in accordance with generally accepted engineering practices associated with environmental acoustics. No other warranty, expressed or implied, is made.

RECORD HILL WIND LLC
RECORD HILL WIND PROJECT
ROXBURY, OXFORD COUNTY, MAINE
SOUND LEVEL ASSESSMENT
(Revised January 19, 2009 to remove Pre-Development Ambient Sound Level Information per MDEP)

CONTENTS

1022

LIST OF ACRONYMS

ANSI	American National Standards Institute
dB	Decibel (Unit of Sound Pressure or Sound Power Level)
dBA	Decibel A-weighted
DEP	Maine Department of Environmental Protection
Hz	Hertz (cycles per second)
ISO	International Organization for Standardization
kV	Kilovolt
kVA	Kilo Volt-Ampere
L_{A1}	Sound Level Exceeded 1% of a Measurement Period (dBA)
L_{A10}	Sound Level Exceeded 10% of a Measurement Period (dBA)
L_{A50}	Sound Level Exceeded 50% of a Measurement Period (dBA)
L_{A90}	Sound Level Exceeded 90% of a Measurement Period (dBA)
L_{Aeq}	Equivalent Sound Level
$L_{Aeq\text{-}Hr}$	Hourly Equivalent Sound Level
L_w	Sound Power Level
MW	Megawatts of Electric Power
mph	Miles per hour
MRSA	Maine Revised Statutes Annotated
msl	mean sea level
PDA	Pre-Development Ambient
PL	Receiver Point at a Protected Location
RHW	Record Hill Wind Project
RSE	Resource Systems Engineering
SLM	Sound Level Meter
SDRS	Short Duration Repetitive Sounds
WTG	Wind Turbine Generator

RECORD HILL WIND LLC
RECORD HILL WIND PROJECT
ROXBURY, OXFORD COUNTY, MAINE

SOUND LEVEL ASSESSMENT

1.0 INTRODUCTION

Resource Systems Engineering (RSE) completed an analysis of sound levels for the Record Hill Wind Project (RHW), a proposed 55 megawatt (MW) wind energy facility to be located in the Town of Roxbury, Oxford County, Maine (see Figure 1-1 Project Site Map). The objectives of the sound assessment were to determine the expected sound levels from routine project operations and to compare RHW sound levels with relevant environmental noise standards.

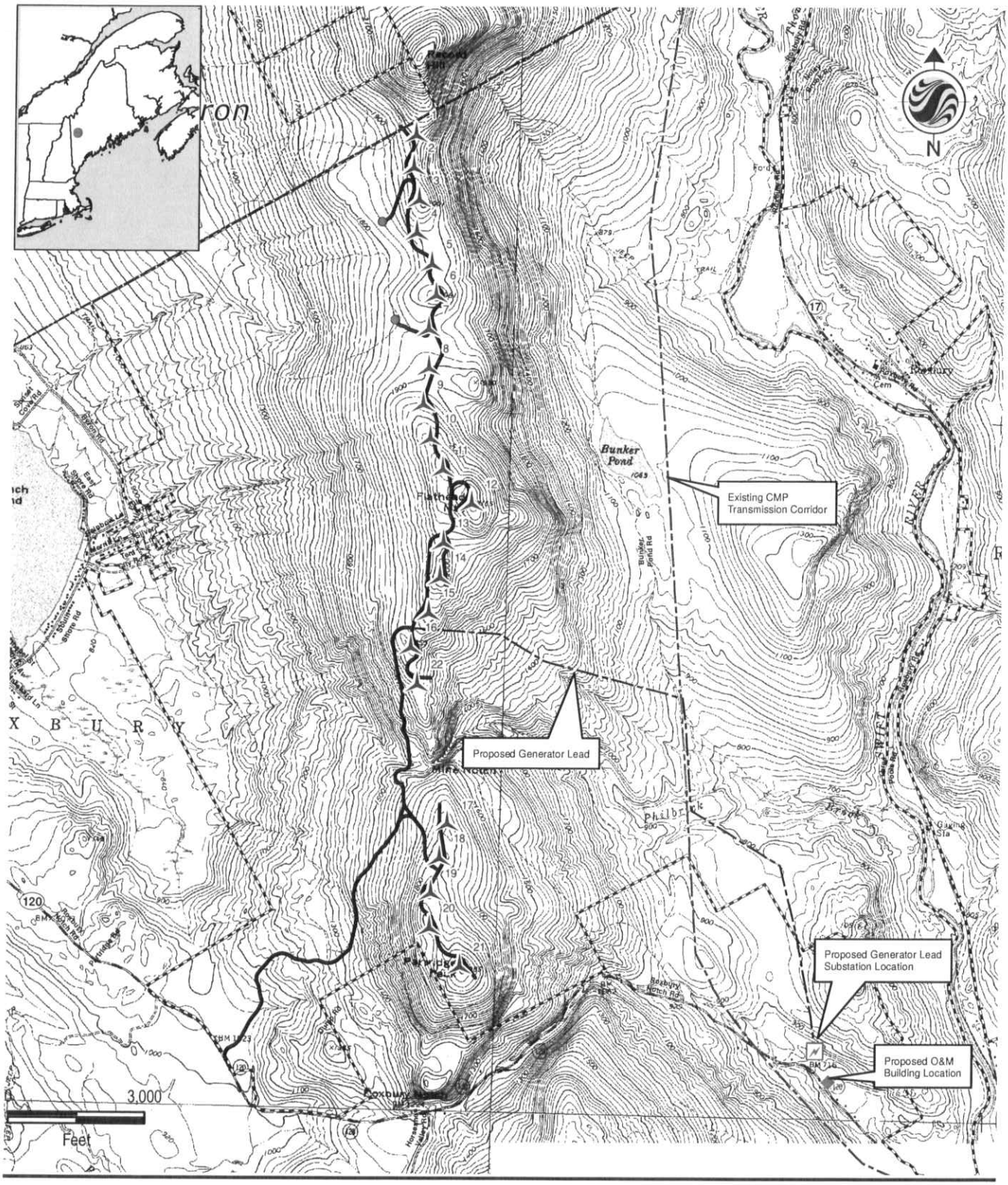
Sound levels generated during construction and operation of many types of facilities can be regulated by federal, state, and local noise standards. The Maine Department of Environmental Protection (DEP) regulates noise under authority of the Site Location of Development Law (38 M.R.S.A 481-490). The current DEP noise regulation, Chapter 375.10, *Control of Noise*, was established in November 1989 to protect certain existing land uses, such as residential properties, schools, and recreation areas, from excessive noise levels generated by new or expanded developments.

The following report provides a description of the wind project, land uses in the project vicinity, applicable DEP sound level limits, and sound level estimates for RHW operations. This Sound Level Assessment (Assessment) provides an evaluation of sound levels from construction and operation of the wind turbines. Sound levels from construction and operation of electric collection facilities, the associated substation and the maintenance facility are not addressed. The sound level estimates are compared to DEP sound level limits to demonstrate that the Record Hill Wind Project will meet applicable regulatory limits.

2.0 SOUND AND DECIBELS

Sound is a rapid fluctuation in pressure that the human ear has the potential to detect. The decibel or dB is the unit of measurement for sound. The decibel scale is logarithmic to avoid large unmanageable numbers normally associated with pressure change. Noise is defined by the American National Standard Institute as unwanted sound. Figure 2-1 shows a comparison of sound pressure and decibel levels for some typical sound environments. Further explanation of sound basics can be found in Appendix I.

1025



Stantec Consulting Services Inc.
30 Park Drive
Topsham, ME USA
04086
Phone (207) 729-1199
Fax: (207) 729-2715
www.stantec.com

Stantec

00115-00-8.5x11_USGS_location.mxd

Legend

- Proposed Turbine
- Proposed Access Roads and Crane Paths
- Proposed Permanent MET Tower
- Wagner Lands

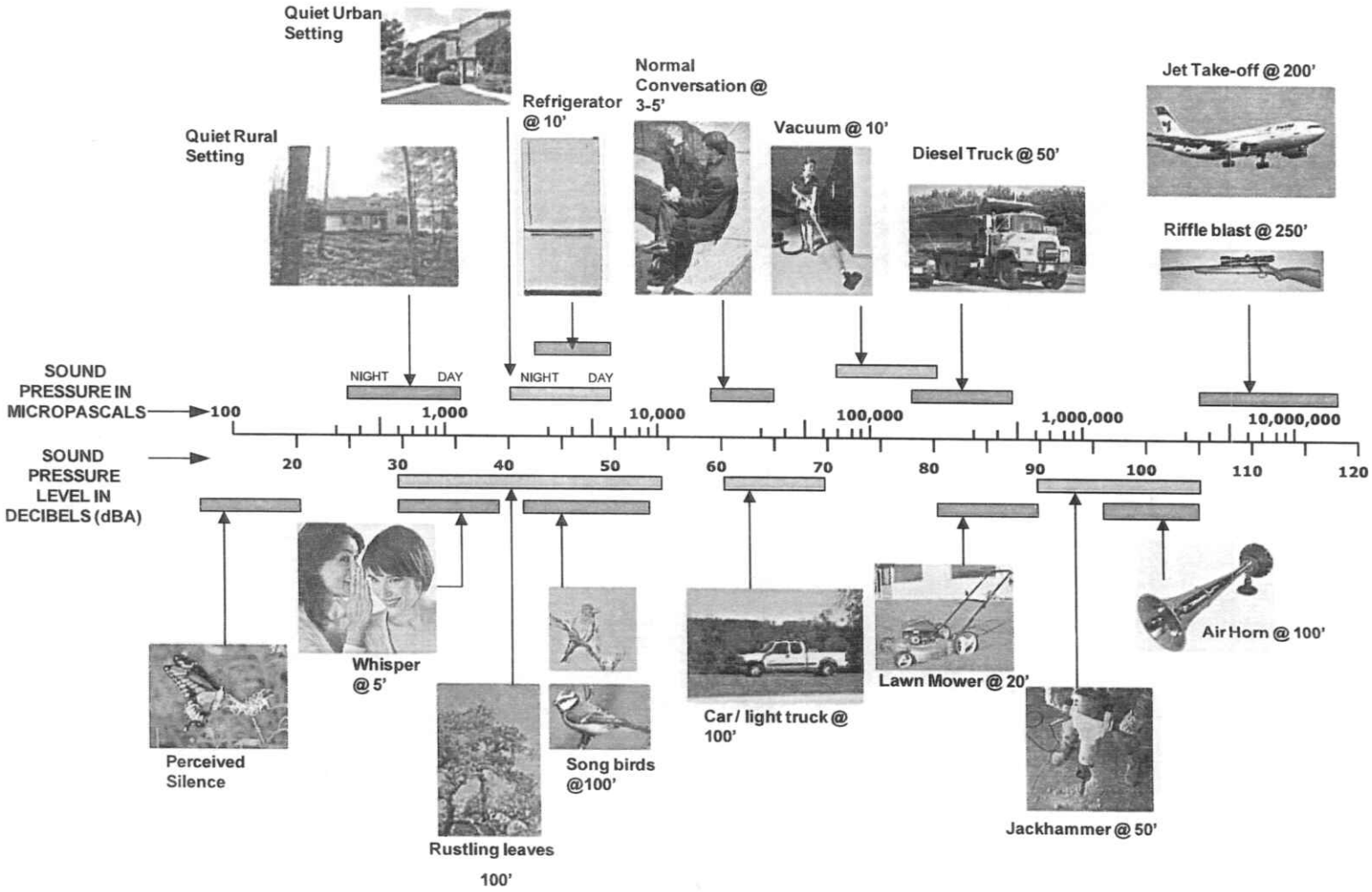
Client/Project
Record Hill Wind, LLC
Record Hill Wind
Roxbury, Maine

Figure No.

Title
Project Site Map
July 22, 2009

FIGURE 2-1

RELATION BETWEEN SOUND PRESSURE IN PASCALS AND TYPICAL SOUND PRESSURE LEVELS IN DECIBELS



Compiled by RSE from Multiple Sources Including: RSE measurements; U.S.E.P.A, "Noise from Construction Equipment and Operations, Building Equipment and Home Appliances," Dec. 1971.; Handbook of Acoustical Measurements and Noise Control, Third Edition, edited by C.M. Harris, McGraw-Hill,1991.; "FHWA Highway Traffic Noise Prediction Model," U.S. Dept. of Transportation, Federal Highway Admin, Washington D.C., FHWA-RD-77-108, December 1978.; U.S.E.P.A, "Information on Levels Noise Requisite to Protect Health and Welfare with an Adequate Margin of Safety," March 1974.; Handbook of Environmental Acoustics, J.P.Cowan, Van Norstrand Reinhold, 1994.

3.0 NOISE CONTROL STANDARDS AND SOUND LEVEL LIMITS

Noise control standards and sound level limits applicable to RHW are presented in the following sections.

3.1 Noise Control Standards

Relevant noise standards consist of regulations established by the DEP. The DEP Regulation Chapter 375.10, *Control of Noise*, was established in November 1989. The DEP regulation applies hourly sound level limits at facility property boundaries and at nearby *protected locations*. Protected locations are defined as "any location accessible by foot, on a parcel of land containing a residence or approved subdivision...." Seasonal residences outside the project area are defined as protected locations (ref. DEP 375.10 G 14). In addition to residential parcels, protected locations also include but are not limited to schools, state parks, and designated wilderness areas (ref. DEP 375.10 G 16).

When a development is located in a municipality that has duly enacted a quantifiable noise standard that (1) contains limits that are not higher than the DEP limits by more than 5 dBA, and (2) limits or addresses the types of sounds regulated by the DEP, then the DEP is to apply the local standard rather than the DEP standard. Further, when noise produced by a facility is received in another municipality, the quantifiable noise standards of the other municipality must be taken into consideration (ref. DEP 375.10 B 1). Inquiries to town offices and review of land use ordinances for Roxbury and Byron indicate that no quantitative noise standards have been enacted in either of these municipalities.

DEP sound level limits at protected locations and property lines have been determined for the RHW Project based on landowner agreements and land uses. Record Hill Wind, LLC is pursuing agreements with local landowners that would exempt the project from sound level limits under the DEP noise regulation. As set forth by DEP 375.10, Section C.5.s, a noise easement exempts the project from DEP limits and remains in effect for the specific noise, parcel of land and term covered by the agreement.

The DEP regulation establishes sound level limits for construction, maintenance, short duration repetitive and tonal sounds as follows:

Construction - Sound from nighttime construction is subject to the same nighttime limits as routine operation. Even though daytime construction limits are contained in DEP Chapter 375.10, normal daytime construction sound levels are exempt from this regulation by Maine Statute (38 M.R.S.A. Section 484). Equipment used in construction must also comply with applicable federal noise regulations and must include environmental noise control devices in proper working condition as originally provided by its manufacturer (ref. DEP 375.10.C.2). Ledge blasting is regulated as part of construction activity.

Maintenance -- Sound from routine, ongoing maintenance activities are considered part of routine operations and subject to the daytime and nighttime limits for routine operation. Sound from occasional, major overhaul activities is regulated as construction activity (ref. DEP 375.10.C.3).

Short Duration Repetitive and Tonal Sounds - When routine operations produce a short duration repetitive or tonal sound, 5 dBA is added to the observed sound levels of these sounds for determining compliance. There is also a maximum sound level (L_{Amax}) limit for certain types of short duration repetitive sounds (ref. DEP 375.10.C.1.d and e).

1028

Table 3-1 summarizes the DEP sound level limits.

TABLE 3-1
DEP Sound Level Limits

Location	Daytime Limit (Hourly L_{Aeq})	Nighttime Limit (Hourly L_{Aeq})	Tonal Sounds	Short Duration Repetitive Sounds (SDRS)
Facility Property Line	75 dBA	75 dBA	No 5 dBA assessment	No 5 dBA assessment or L_{Amax} limit
Protected Location zoned Commercial, Industrial or Transportation	70 dBA	60 dBA within 500 feet of sleeping quarters otherwise 70 dBA	5 dBA assessment applies to Tonal Sounds	5 dBA assessment and possible L_{Amax} limit for SDRS
Protected Location zoned Residential, Rural or Similar Land Use	60 dBA	50 dBA within 500 feet of sleeping quarters otherwise 60 dBA	5 dBA assessment applies to Tonal Sounds	5 dBA assessment and possible L_{Amax} limit for SDRS
Quiet Area - Protected Location where existing daytime sound level is 45 dBA and/or less and nighttime sound level is 35 dBA or less	55 dBA	45 dBA within 500 feet of sleeping quarters otherwise 55 dBA	5 dBA assessment applies to Tonal Sounds	5 dBA assessment and possible L_{Amax} limit for SDRS
Noisy Area - Protected Location where existing daytime or nighttime sound level exceeds standard daytime and/or nighttime limits	Pre-development daytime sound level minus 5 dBA (per election of applicant)	Pre-development nighttime sound level minus 5 dBA (per election of applicant)	5 dBA assessment applies to Tonal Sounds	5 dBA assessment and possible L_{Amax} limit for SDRS

Sounds associated with certain activities are exempt from regulation under DEP Chapter 375.10 or by statute. Exempt activities associated with the proposed wind project can include (ref. DEP 375.10.C.5):

- Construction activity during daylight or daytime hours, whichever is longer;
- Emergency maintenance and repairs;
- Snow removal and landscaping;
- Emergency maintenance and repairs;
- Warning signals and alarms;
- Safety and protective devices installed in accordance with code requirements;
- Test operations of emergency equipment occurring in the daytime no more frequently than once per week;
- Major concrete pours that must be extended after 7:00 pm, when started before 3:00 pm; and
- A force majeure event and other causes not reasonably within the control of the owners or operators of the development.

3.2 RWH Sound Level Limits

RHW voluntarily chose to be regulated by the DEP quiet area standards. Therefore, the most restrictive DEP sound level limit of 45 dBA applies to RHW during nighttime hours (7:00 pm to 7:00 am) at locations on residential parcels that are within 500 feet of a residence. The quiet daytime limit of 55 dBA applies during daytime hours (7:00 am to 7:00 pm) and during all hours at locations on residential parcels that are over 500

feet from a residence. The RHW project must be in compliance with the DEP sound limits applicable to construction, routine operation and routine maintenance.

Figure 3-1 presents a Vicinity Site Plan that shows residential parcels in relation to the RHW project area. Also shown on Figure 3-1 are parcels where the most restrictive sound level limits apply and other points of interest for local landowners. These locations are identified by the symbol PL. Table 3-2 presents a list of the mapped PLs, their approximate distance from the nearest proposed wind turbine and the applicable DEP limits.

Table 3-2
RHW Hourly Sound Level Limits (dBA)

Protected Location [A]	Description	Approximate Distance From Nearest Wind Turbine (ft)	DEP Hourly Limit (dBA)		Limit Basis
			Daytime	Nighttime	
PL1	Northeast of Turbine 1, on the Roxbury/Byron Town Line and Property Line of project	6,000 (1,800 m)	55	55 [B]	Residential Property Line >500 ft from Dwelling
PL2	Northeast of Flathead Mtn. at Property Line and Residential Lot Line	6,800 (2,100 m)	55	55 [B]	Residential Property Line >500 ft from Dwelling
PL3	East of Partridge Peak at Property Line	2,800 (900 m)	55	55 [B]	Residential Property Line >500 ft from Dwelling
PL4	East of Partridge Peak at Property Line	3,100 (1,000 m)	55	45	Residential Property Line within 500 ft of Dwelling
PL5	South of Partridge Peak, Property Line	3,100 (900 m)	55	45	Residential Property Line within 500 ft of Dwelling
PL6	West of Partridge Peak, Property Line	3,500 (1,100 m)	55	55 [B]	Residential Property Line >500 ft from Dwelling
PL7	Southeast Shore of Roxbury Pond, Residential Area	8,100 (2,500 m)	55	45	Residential Property Line within 500 ft of Dwelling
PL8	Southwest Shore of Roxbury Pond, Residential Area	11,500 (3,500 m)	55	45	Residential Property Line within 500 ft of Dwelling
PL9	Northwest of Turbine 1,along the East Shore of Little Roxbury Pond (Residential Area in Byron)	11,300 (3,400 m)	55	45	Residential Property Line within 500 ft of Dwelling

[A] See Figure 3-1, Vicinity Site Plan.
[B] Applies at property boundary and when ≤500 feet to dwelling 45 dBA.

4.0 SITE/PROJECT DESCRIPTION

The Record Hill Wind project will be located in the Town of Roxbury on a north-south ridgeline including the south side of Record Hill, Flathead Mountain, Mine Notch and Partridge Peak. A Project Site Map (Figure 1-1) and Vicinity Site Plan (Figure 3-1) show the proposed wind turbine layout, electric collector lines, substation and maintenance facility in relation to topography and surrounding land uses. Figure 3-1 also shows property boundaries and residences in the vicinity of the project. The area is mountainous terrain with active logging roads and ATV trails throughout. In relation to the proposed wind turbines, Route 17 is to the east, Roxbury Notch Road (Route 120) is to the south, Shore Road and Roxbury Pond are to the west and the Town of Byron and Record Hill peak are to the north. Permanent and seasonal residential properties are located along Route 17, Roxbury Notch Road and Shore Road along Roxbury Pond. There is a concentration of permanent

residences in the village of Roxbury along Route 17 and both permanent and seasonal residences along the east and south shores of Roxbury Pond.

Based on aerial photography, field surveys and local tax records, uses in the vicinity of the project consist of undeveloped/forestry land in areas surrounding the proposed turbine sites. Rural residential and seasonal properties are located to the east, south and west of the project area with the nearest residential property (PL3) approximately 2,800 feet to the east of the nearest proposed wind turbine on Partridge Peak. The approximate distance from the proposed wind turbines on Partridge Peak to the nearest residential property (PL5) to the southwest is 3,100 feet. The approximate distance from the proposed wind turbines on Partridge Peak to the nearest residential property (PL6) to the west is 3,500 feet. The approximate distance to the nearest residential property (PL2) in the Roxbury Village area and east of the nearest proposed wind turbine (midway between Record Hill and Flathead Mountain) is 6,800 feet. All of the closest residential properties in the vicinity of the project are located in the Town of Roxbury.

Record Hill Wind, LLC holds a lease with a local landowner to install and operate wind turbines at the proposed locations. Record Hill Wind, LLC is pursuing other agreements with abutting landowners. Parcels for which the developer has a lease, easement or pursuing other agreements in the vicinity of the project are indicated on Figure 3-1.

The majority of the proposed turbine area is presently used for commercial forestry operations and contains developed logging roads. Existing logging roads will be upgraded and used, where appropriate, to minimize clearing and wetland impacts. The project area is also extensively used for recreation including ATV and snowmobile trails and hunting. The proposed turbines will run along a north-south oriented ridgeline with base elevations, above mean sea level (msl), ranging from approximately 2,033 feet on Record Hill at the north end; 2,160 feet midway on Flathead Mountain to 1,970 feet on Partridge Peak to the south. In addition to the turbine structures, the project will include construction of an operations and maintenance facility to the southwest of Partridge Peak and a substation to the southeast of Flathead Mountain.

RHW consists of a 22 turbine array along with its associated electrical interconnection infrastructure and ridgeline meteorological tower. The turbine array is located entirely within the town of Roxbury, Maine. The wind turbine array starts from just south of the Roxbury-Byron town line on Record Hill and extends approximately 3.5 miles south to Partridge Peak. Originally RHW was conceived to include land in the adjoining town of Byron where the ridge continues north to Old Turk Mountain. However, the RHW scope was reduced after the residents of Byron opted not to amend its height ordinance to allow for wind turbines. Access to the ridgeline is proposed to be provided by upgrading and extending existing logging roads from Route 120.

RHW proposes to use Clipper C96 wind turbines (each 2.5 megawatts (MW) capacity) on towers that will place the hub height at 80 meters (262 feet) and have blades that reach heights of about 128 meters (420 feet) above ground level. The total nameplate capacity of RHW will be 55 MW.

Power generated by the turbine array will be collected by 34.5 kilovolt (kV) lines and carried approximately one mile east down the ridge to a collector substation located alongside an existing Central Maine Power transmission line right of way. The voltage will be increased to 115 kV at the collector substation, then transferred to the adjacent Central Maine Power system and ultimately delivered to the New England grid.

5.0 RECORD HILL WIND SOUND LEVELS

Future project sound levels will be produced by construction activity plus operation and maintenance of the wind turbine generators, electric collection facilities, substation and maintenance facility. This section describes sound expected from the construction and operation of wind turbines.

5.1 Construction

Sound from construction activity is both temporary and variable. Many construction machines operate intermittently and equipment varies with each construction phase. A variety of construction equipment will be used to build the wind project including earth-moving equipment for land clearing, excavation, site grading and cranes to erect the wind turbines. Typical earth moving equipment and cranes generate sound levels of 75 to 88 dBA at a distance of 50 feet. These sound levels are typical front end loaders, bulldozers, gravel trucks, skidders, log harvesters and logging trucks commonly used in the Town of Roxbury.

Sound levels from construction may be noticeable in the vicinity of the site, especially during blasting, excavation and grading. However, construction sound will be reduced at protected locations by the distance from the construction site and intervening terrain. Topographic features at the construction sites in relation to noise sensitive receivers provide full or partial barrier effects thereby reducing construction sounds. Local traffic during construction is expected to increase on some public roads along with associated sound levels from construction vehicles. Traffic and construction sound are expected to be in the range of sounds from existing logging and associated trucking activity. Because of the temporary nature of construction, no adverse or long-term effects are anticipated.

The mobile nature of construction equipment and the manner in which construction work must be done makes complete control of construction sound infeasible. With the possible exception of nighttime blade lifts, construction activity will occur between the hours of 7 a.m. and 7 p.m. or daylight hours when ambient background sounds generally tend to be higher. Daylight construction is not subject to DEP sound limits. Sound from nighttime crane lifts is not expected to exceed sound levels from routine operation and will be required to comply with DEP nighttime limits between 7 pm and 7 am or after dark (one-half hour after sunset to one-half hour before sunrise) whichever is the shorter period.

Other measures to mitigate construction sound levels will include compliance with federal regulations limiting sound from trucks and portable compressors, ensuring that equipment and sound muffling devices provided by the manufacturer (or equivalent) are kept in good working condition and no nighttime blasting.

5.2 Proposed Operation

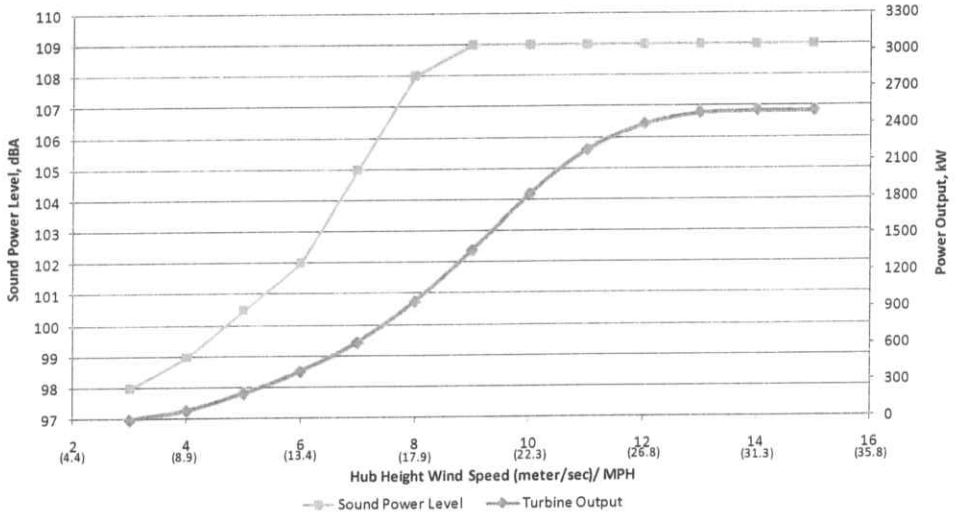
Operation of the proposed project will consist of 22 wind turbines operating up to 24 hours per day, seven days per week producing up to 55 MW of electrical power. The actual level of power production will be governed by the wind speed at the hub height. The actual level of wind turbine sound will vary with electric power production.

RSE developed a sound level prediction model to estimate sound levels from operation of the proposed Record Hill Wind Project. The acoustic model was developed using the CADNA/A software program performing calculations in accordance with the generally recognized standard for estimating the propagation of sound in the environment promulgated by the International Standards Organization (ISO) as
Chapter 9613-2, *Attenuation of Sound During Propagation Outdoors* . CADNA/A uses three dimensional terrain, proposed wind turbine characteristics and locations plus environmental factors to calculate outdoor sound propagation from the wind turbines. Area topography and wind turbine locations, for entry into CADNA/A, were provided to RSE by Stantec Consulting based on USGS topographic information and project design. Information

for the project study area is presented on Figure 3-1 and includes the turbine locations, USGS topographic contours, parcel mapping with hatching to show parcels with easements or agreements, dwelling locations, public and private roads, and water bodies.

The wind energy project will be capable of operating any time of the day or night, including holidays and weekends. However, the wind turbines will begin to rotate as the hub-height wind speed increases from 0 to 4 m/s (0 to 9 mph), the "cut-in" wind speed. When the wind incident on the turbine hub is at or above the "cut-in" wind speed of 4 m/s (9 mph) electrical power will be delivered to the grid. During periods of light or calm hub winds, sound level emissions from RHW will be very low. As wind speed increases, the turbines begin to rotate and will reach full sound power output at approximately 9 meters per second (20 mph) or approximately 60% of rated power output. Full electrical power output occurs when the hub-height wind speed is at or above 13 meters per second (29 mph). The turbines shutdown or "cut-out" when hub-height winds reach 25 meters per second (56 mph). Figure 5-1 presents a plot of electrical production and sound power level versus wind speed at the turbine hub for wind speeds ranging from 3 to 15 meters per second (7 to 34 mph). Figure 5-1 shows that moderate to full electrical output is produced with wind speeds at or above 9 meters per second (20 mph) at the turbine hub. Figure 5-1 also indicates that full sound power occurs when hub-height wind is at or above 9 meters per second. The sound power level is approximately 4 dBA less at a hub wind speed of 7 meters per second (16 mph) and 11 dBA less at 3 meters per second (7 mph).

Figure 5-1. Sound Power Level and Power Output of Clipper Liberty 2.5 Wind Turbine in relation to Hub Wind Speed

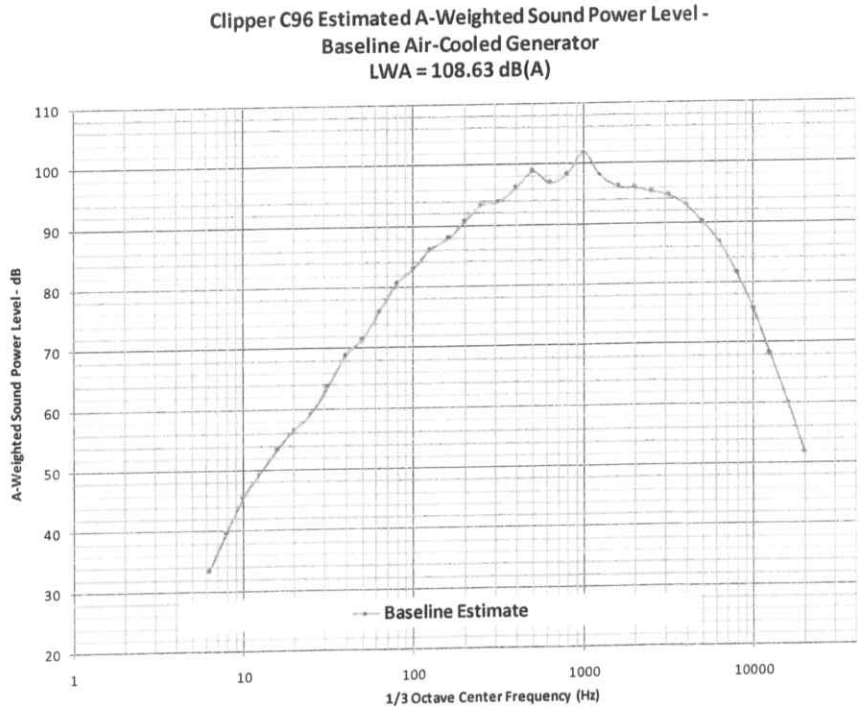


Source: Clipper C96 Specifications

RSE calculated sound levels for simultaneous operation of the Clipper Liberty C96 2.5 MW wind turbines at all 22 prospective locations. Calculations were based on the apparent sound power spectrum produced at full sound power provided by Clipper Wind Power. The wind turbines were treated as point sources at the hub height of 80 meters (262 feet) above base/grade elevation using sound power levels provided by Clipper Wind Power and presented in Table 5-1 and Figure 5-2. RSE computed sound power for whole octaves from the one-third octave spectrum provided by Clipper.

TABLE 5-1 WIND TURBINE SOUND POWER LEVELS (Wind Speed = 12.6 m/s at turbine hub)			
3rd Octave Band Center Frequency, Hz	**Sound Power Level, dBA**	**Octave Band Center Frequency, Hz**	**Sound Power Level, dBA**
50	71.6		
63	76.1	63	82.4
80	80.8		
100	83.2		
125	86.3	125	91.1
160	88.1		
200	90.9		
250	93.5	250	97.8
315	94.1		
400	96.3		
500	99	500	102.4
630	97.1		
800	98.5		
1000	102	1000	104.7
1250	98.2		
1600	96.3		
2000	96.1	2000	100.7
2500	95.4		
3150	94.8		
4000	93.1	4000	97.9
5000	90.3		
6300	86.9		
8000	81.7	8000	88.3
10000	75.7		
SUM	**108.6**	**SUM**	**108.6**
Source: Clipper C96 Specifications, July 30, 2008			

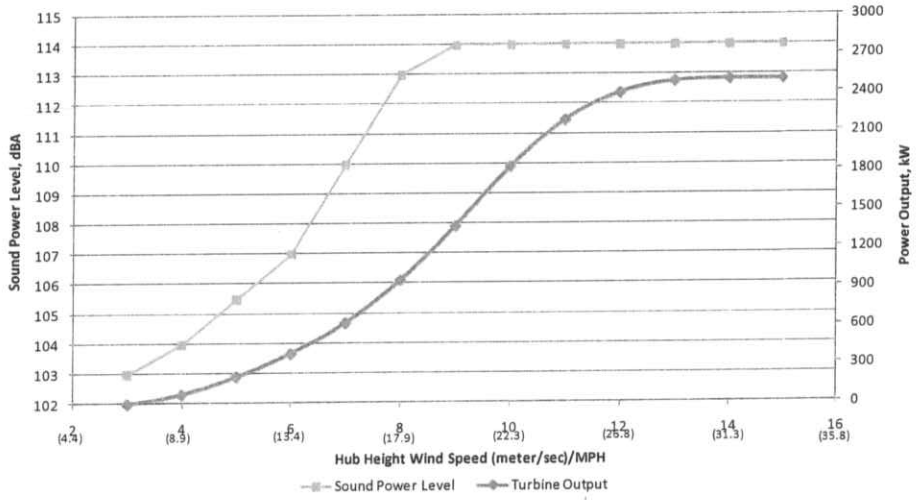
Figure 5-2.



1034

RSE sound level model estimates are based on the maximum sound power level specification provided by Clipper plus uncertainty factors for wind turbine sound power and outdoor propagation. Figure 5-3 presents the sound power level as a function of wind speed and electrical power production with 5 dBA added by RSE to account for uncertainty factors.

Figure 5-3. Sound Power Level and Power Output of Clipper Liberty 2.5 Wind Turbine in relation to Hub Wind Speed with 5 dBA added to Clipper Specifications



Source: Clipper C96 Specifications

Using the sound prediction model, sound level contours for operation of the proposed wind project were calculated for the entire study area and are presented in Figure 5-4. Sound level contours of 55 dBA and 45 dBA are highlighted to correspond to DEP quiet daytime and nighttime limits respectively. The 35 dBA contour is also highlighted and shows how sound propagation differs over water when compared to over land. From these contours, the expected sound levels during 60 % to 100% of full rated electrical production can be determined for any point within the study area. This range of operations produces the maximum sound power levels emitted by the wind turbines. Selected positions representing the nearest protected locations to the turbines are shown on Figures 3-1 and 5-4. Calculated sound levels at the selected protected locations are indicated on these figures. Table 5-2 shows distances of protected locations from the nearest proposed wind turbine and compares estimated sound levels with the most stringent DEP nighttime sound level limits applicable to each position.

Sound levels from wind turbine operation are presented for nine residential receiver points (PL1 to PL9) in the vicinity of the proposed wind project. Selected points represent nearby protected locations where the most stringent DEP nighttime limits apply and other points of local interest (e.g. PL8 and PL9). Sound levels at these points have the greatest potential to exceed applicable DEP limits. Landowner agreements are expected at protected locations closer to the wind turbines than the nearest receiver points (see Figures 3-1 and 5-4). Under these agreements no sound level limits will apply at these properties (ref. DEP 375.10, Section C 5.s).

Sound level attenuation from the wind turbines was calculated by the acoustic model in accordance with ISO 9613-2. ISO 9613-2 is an international standard commonly used for predicting sound levels from a noise source for moderate downwind condition in all directions. Attenuation is calculated for distance, atmospheric absorption and intervening terrain. Conservative factors were applied for ground absorption assuming a mix of hard and soft ground. The surfaces of nearby lakes were specifically mapped and lake surfaces were assigned no ground absorption as appropriate for a hard, reflective surface. The model calculations exclude attenuation from foliage, which has the potential to reduce sound levels.

TABLE 5-2 ESTIMATED (Modeled) SOUND LEVELS FROM WIND TURBINE OPERATION				
Residential Receiver Position	**Distance to Nearest Wind Turbine, Feet**	**Estimated Hourly Sound Level, L_{Aeq-Hr}**	**DEP Nighttime Limit, dBA**	**Difference between WTG Estimated Hourly Sound Level and DEP Nighttime Limit (dBA)**
PL1	6,000	36	55	-19
PL2	6,800	39	55	-16
PL3	2,800	44	55	-11
PL4	3,100	41	45	-14
PL5	3,100	43	45	-2
PL6	3,500	45	55	-10
PL7	8,100	37	45	-8
PL8	11,500	37	45	-8
PL9	11,000	33	45	-12

The results presented in Figure 5-4 and Table 5-2 indicate that sound levels at full operation of the wind project will be from 2 to 19 dBA below the most stringent DEP nighttime sound level limits at the closest protected locations.

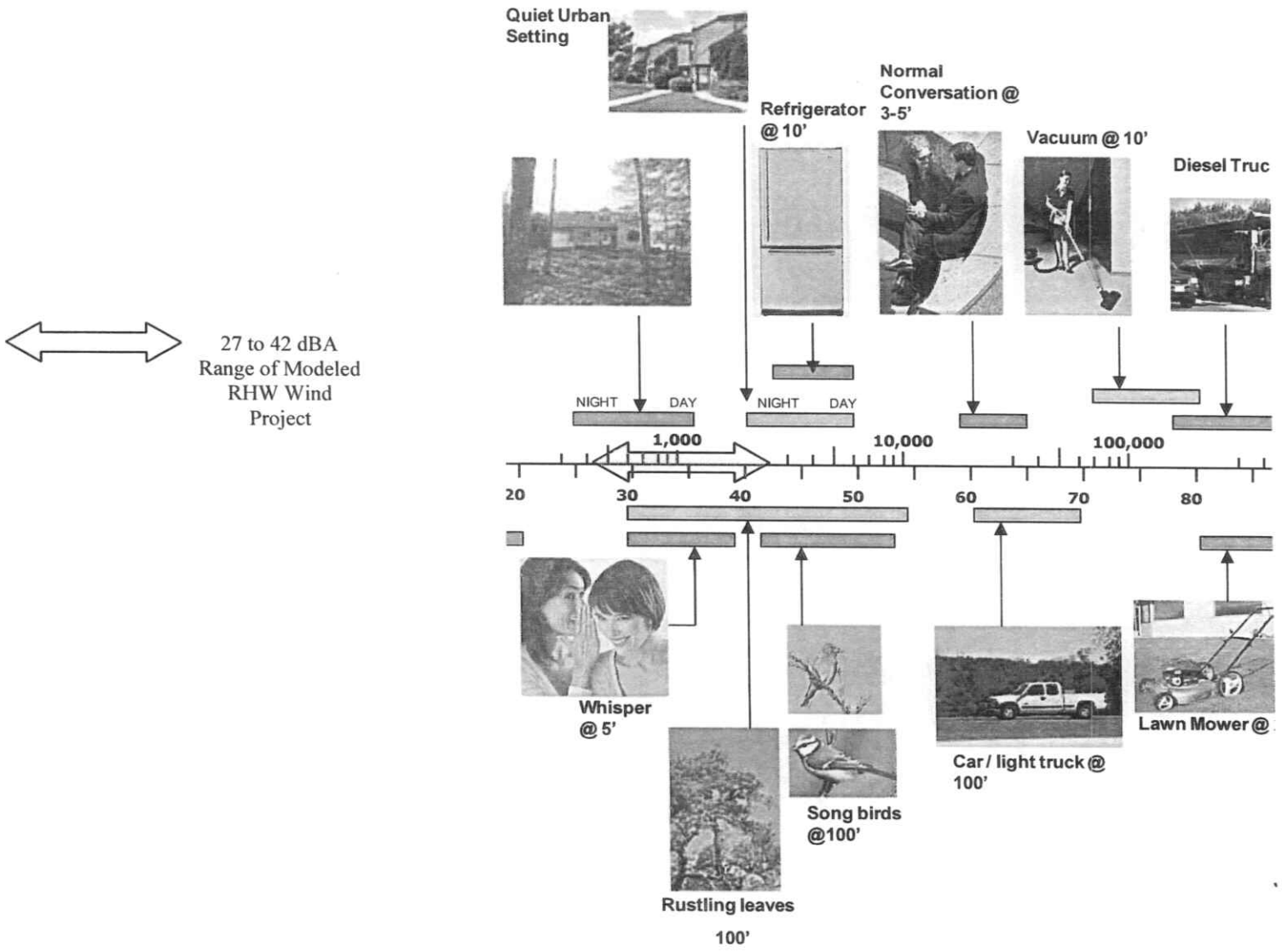
5.3 Proposed Operation

There are large fluctuations in wind speed from the hub height of the wind turbines at 262 feet to the regulated height of four to five feet above ground level. This can be a significant factor in sound emissions and outdoor propagation from the wind project. The quietest periods of the day or night generally occur when surface winds are light or calm. In addition, as the wind speed incident on a wind turbine drops, sound levels from the turbine are reduced as shown in Figure 5-1 and Figure 5-3.

Variations in wind speed with elevation (wind gradient) may result in very different wind speeds near the surface and tree tops than at turbine/rotor heights. In addition, there may be areas near the ground that are shielded from winds from certain directions. For example, with the general ridge line direction running north-south, lower land to the east would be protected from a westerly wind. Under these conditions, high winds may be present near the top and to the west of the wind turbines, but winds may be relatively calm just east of the ridgeline. However, dwellings are located well east of the ridgeline where shielding from wind would be less. Consequently, the degree of masking by wind-induced ambient sound will fluctuate depending on the wind speed, direction, and location.

Figure 5-5 presents the range of estimated RHW sounds in relation to typical sounds. Figure 5-5 shows that RHW sounds are expected to be at the low end of typical sound levels and comparable to a quiet rural setting, whispering, song birds and the low end of rustling leaves.

Figure 5-5
RHW and Typical Sound Levels



5.4 Tonal and Short Duration Repetitive Sound

A regulated tonal sound occurs when the sound level in a one-third octave band exceeds the arithmetic average of the sound levels in the two adjacent one-third octave bands by a specified dB amount based on octave center frequencies (ref. DEP 375.10.G.24). Clipper C96 turbine performance specifications shown in Figure 5-2 indicate some potential for tonal sounds to occur in the 500 and 1000 Hz third-octave bands. Clipper C96 specifications indicate that the tonal threshold of 8 dBA is not likely to be exceeded. Therefore, the Clipper C96 wind turbines are not expected to generate regulated tonal sounds.

Short duration repetitive (SDR) sounds are a sequence of sound events each clearly discernible that causes an increase of 6 dBA or more in the sound level observed before and after the event. SDR sound events are typically less than 10 seconds in duration and occur more than once within an hour. Published studies of noise from wind turbine operations indicate that sound levels can fluctuate over brief periods as noted by the passage of wind turbine blades and typically range from 2 to 4 dBA.[1] Consequently, RHW operations are not expected to result in the 6 dBA increase required to be SDR sounds as set forth in DEP 375.10.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The primary objectives of the Sound Level Assessment were to determine applicable sound level limits at protected locations and lot lines, estimate future sound levels from the proposed wind power project, and evaluate compliance with applicable sound level limits. Existing land uses were identified using a combination of site maps, aerial images, and field observations. Sound level estimates of future wind turbine operations were calculated using a terrain-based acoustic model.

Sound level limits were applied per DEP 375.10 based on land use mapping and landowner agreements. To be conservative with this sound level assessment, quiet limits of 45 dBA nighttime and 55 dBA daytime were utilized per DEP regulations.

The results of this assessment indicate that sound levels from wind turbines are not expected to exceed DEP sound level limits during construction or routine operations. Specifically, model estimates show that sound levels from the wind project will be below the DEP nighttime limit of 45 dBA within 500 feet of any dwelling at all protected locations.

Once construction and startup of the wind project are complete, RSE recommends monitoring sound levels during routine operations to verify sound level compliance with relevant DEP sound level limits.

[1] ETSU-R-97, The Assessment and Rating of Noise from Wind Farms, 1996.

FIGURE 3-1. Vicinity Site Plan

1640

FIGURE 5-4. Estimated (Modeled) Sound Level Contours